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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 36.] DECEMBER. [1889.

CXXII.—POISONING FROM TURNSOLE IN PERSIA.

(*Chrozophora tinctoria*, A. Juss.)

The following correspondence has recently taken place respecting the poisonous properties of the Turnsole (*Chrozophora tinctoria*, A. Juss. Tent. Euphorb. 28, t. 7, f. 25). This is an annual plant, with prostrate habit and softly clothed with stellate tomentum. It is found in the Mediterranean region, and extends eastward to Afghanistan and India. The poisonous character of the plant does not appear to have been dwelt upon, but there can be little doubt, from the observations of Mr. Casson in Persia, that under certain circumstances it is deadly in its effects on human life, and this fact cannot be too widely known :—

Mr. Casson to Royal Gardens, Kew.

Her Majesty's Legation, Tehran,
July 8, 1889.

Sir,

I have the honour to enclose specimen of a plant, known by the Persians as Tatuleh, from the eating of which I found six persons, varying in age from 65 to 8 years, exhibiting marked symptoms of

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acute poisoning, and all of whom, at intervals varying from 36 to 72 hours, actually died. The symptoms they exhibited were severe jaundice, abdominal pain, severe vomiting of bilious character, dilation of pupil, bleeding from nose, constipation, bloody urine tinged deeply with bile, and more or less stupor. All died in a comatose state. If you could give me any information as to whether the plant is known in Europe or any other particulars I should be greatly obliged, as I feel that the case is one of sufficient toxicological interest to be reported to the Medical Societies at home. It appears that the plant is known by the Persians to be poisonous to man, and in this unfortunate instance was gathered by an ignorant woman in mistake for another plant which it much resembles, and which is used in this country as an article of food. In any case I have thought it worthy of bringing under your notice. I may add that all who ate of the plant died.

I have, &c.

(Signed) J. Hornsey Casson,
Physician to Her Majesty's Legation
in Persia.

To the Director of the
Royal Botanical Gardens, Kew.

Royal Gardens, Kew, to Mr. Casson.

Royal Gardens, Kew, October 14, 1889.

Sir,

I have the honour to acknowledge the receipt of your letter of July 8th, transmitting specimens of a plant, known by the Persians as Tatuleh, which you inform me has proved fatal to six persons who had eaten it by mistake.

2. The plant belongs to the natural order *Euphorbiaceæ*, which abounds in acrid and poisonous species such as the Physic nut (*Jatropha Curcas*), Croton oil (*Croton Tiglium*), and Manchineel (*Hippomane Mancinella*). It has been identified as *Chrozophora tinctoria*, a plant indigenous throughout the Mediterranean basin. I have failed to find any record of its having been found to be fatally poisonous. Lindley, however, states in his Flora Medica (p. 179) that it is "an acrid plant, "with emetic, drastic, corrosive properties. Its seeds, ground into "powder and mixed with oil, are employed as a cathartic medicine. "It is cultivated for the deep purple dye called Turnsole which is "obtained from it."

3. An account of this product is given by the late Daniel Hanbury, F.R.S., in the Pharmaceutical Journal (1849–50, pp. 308–9). It is termed Turnsole rags, *Tournesole en drapeaux*, to distinguish it from Litmus or *Tournesole en pains*, the origin of which is different. The juice of the plant is expressed, and, at first dark green, becomes purple on exposure to the air. Turnesole rags are pieces of coarse sacking, which are soaked in the juice and then dried. The manufacture of Turnsole has been carried on in the south of France from an early period. At the time Hanbury wrote they had fallen into disuse everywhere except in Holland, where it was believed their only use was to colour the exterior of cheese.

I am, &c.

(Signed) W. T. Thiselton Dyer.

J. Hornsey Casson, Esq., M.R.C.S.,
H. M.'s Legation, Tehran, Persia.

CXXIII.—MUSSÆNDA COFFEE.

(*Gærtnera vaginata*, Lam.)

Under the name of *Mussænda borbonica*, M. Lapeyrère, a French apothecary, has described in the *Bulletin Bimensuel de la Société Nationale d'Acclimitation de France*, 1888, pp. 285–300, a plant found at Réunion, which he believed would yield a commercial substitute for coffee. From specimens of the seeds forwarded to Kew by the Foreign Office, and from other information obtained on the subject, it appears that the plant in question, described as a new species, was not a *Mussænda* at all, but a well known member of the natural order *Loganiaceæ*. It has been identified at Kew as *Gærtnera vaginata*, Lam., found in mountain woods in Mauritius and also in Bourbon and Madagascar. The two pyrenes found in the fruit, although smaller, have a superficial resemblance in form and texture to true coffee "beans." They are, however, marked with radiating lines on both surfaces, and in this respect, and in the dull-reddish colour, they may be readily distinguished.

On the subject of Mussænda Coffee the Foreign Office has communicated to this establishment the following correspondence, giving the result of inquiry made at Réunion by Mr. C. St. John the British Consul.

FOREIGN OFFICE to ROYAL GARDENS, KEW.

SIR, Foreign Office, June 26, 1889.

I AM directed by the Secretary of State for Foreign Affairs to transmit to you, to be laid before the Director of Kew Gardens, the accompanying copy of a despatch respecting the *Mussænda* or Wild Orange.

Samples of the seed which Mr. St. John reports that he has forwarded will be sent to you upon their receipt at this office.

I am, &c.

The Assistant Director, (Signed) JAMES FERGUSON.
Royal Gardens, Kew.

[Enclosure.]

Mr. Consul ST. JOHN to FOREIGN OFFICE.

MY LORD, Réunion, May 14, 1889.

As an article has appeared on page 12 of the "British Mail" of February last, relative to a shrub commonly called Mussænda, and several letters have been addressed to this Consulate for information on the subject, I beg to offer a few observations and information derived from a reliable source.

Unfounded rumours relative to the merits of the shrub have caused alarm as to the future of the coffee and chicory trade; but nothing of the kind, so far as Réunion is concerned, need be apprehended. The information given in the "British Mail" as to the quantity of Mussænda produced in this Colony might be misleading.

Some 18 months ago a chemist in search of notoriety spread a report that the berry of this shrub could replace coffee and chicory, and the question was much talked about and discussed, but all interest in the subject soon ceased.

The real name is Gærtnera. It rises to a height of 10 feet, has but few leaves, and the branches are wide apart. The berry, when gathered, is peeled, and then much resembles the coffee berry, though smaller. In fragrance it is inferior to coffee, and in colour to chicory.

The shrub at present found in the forest is not plentiful, and only bears at the extreme end of the branches, instead of all along. The yield is far less than that of the coffee tree, and the picking more expensive, that is to say, about 1*s.* the pound. It is much doubted by reason of its inferiority that Mussænda could ever compete with coffee and chicory, even if it were cultivated.

From an inquiry made at the Chamber of Commerce of St. Denis on the subject, the correctness of the above statement is fully established.

I have, &c.

(Signed) C. St. John.

The Marquis of Salisbury, K.G.,
&c. &c. &c.

The real value of Gærtnera seeds as a coffee substitute entirely depends on whether or not they contain caffeine.

M. Lapeyrère, in his paper above cited (p. 292), states that the unroasted beans contain ·30 to ·55 per cent. of this substance, unroasted coffee beans containing ·80 to 1 per cent. While there would be nothing improbable in a plant belonging to the same family as coffee, *Rubiaceæ*, containing caffeine, it is quite the reverse in the case of a member of the *Strychnos* family, *Loganiaceæ*. A sample of the seeds was therefore submitted to Mr. Wyndham Dunstan, Professor of Chemistry to the Pharmaceutical Society of Great Britain, who has kindly furnished the following report, and the results of his examination.

Professor Dunstan to Royal Gardens, Kew.

Pharmaceutical Society of Great Britain,
17, Bloomsbury Square, W.C.,
Research Laboratory, October 21, 1889.

Dear Mr. Dyer,

I have examined the chemical constituents of seeds of *Gærtnera vaginata* which you sent me.

A special search was made for caffeine or any other similar alkaloid. One hundred and fifty grains of the finely powdered seeds were mixed with fifty grains of magnesia and made into a paste with water. The mixture was thoroughly dried and powdered. The powder was successively exhausted with boiling chloroform, boiling alcohol, and boiling water, and the residue left by the evaporation of the solvents was carefully examined for caffeine, but not a trace of this, or indeed of any other alkaloid, could be detected.

I propose to communicate to the Pharmaceutical Society, at its next meeting in November, further details about these and other experiments I have made. They prove beyond question that no caffeine is present,

and therefore that the seeds cannot be regarded as a proper substitute for coffee.

I am, &c.
(Signed) WYNDHAM R. DUNSTAN.

It is clear, therefore, that as regards essential composition, Mussænda Coffee is of no more value as a coffee substitute than chicory, date coffee, acorns, and a variety of other substances which have from time to time been used or recommended.

CXXIV.—FOOD GRAINS OF INDIA (*continued*).

(*Dendrocalamus strictus*, Nees.)

In continuation of the investigations undertaken by Professor A. H. Church, F.R.S., respecting the alimentary value of the chief food grains of our Eastern Empire (*Kew Bulletin*, December 1887, p. 7, and *l. c.* 1888, p. 266), supplementing those given by the same author in the *Food Grains of India* (London: Chapman and Hall, 1886), there is now given an analysis of the grain of the Male Bamboo (*Dendrocalamus strictus*, Nees). This grain was received at Kew in August last from the Agricultural and Horticultural Society of India.

The Male Bamboo * is in many respects an interesting plant, and a few words on its characteristics and distribution may precede the results of the chemical analysis of the grain.

Dendrocalamus strictus, Nees, (Bambusa stricta, Roxb. Fl. Ind. ii. 193), is described and figured by Brandis, *Forest Flora* of N. W. and Central India, p. 569, tab. lxx. It is a middle-sized, generally deciduous, bamboo. The stems have a small central cavity or are entirely solid. They are closely packed in dense clumps, and the stiff leafless branches near the base assume a spinose character. The joints are 12 to 18 inches long and 1 to 3 inches in diameter. The leaves are exceedingly variable in size, from 3 to 9 inches long, and a quarter of an inch to 1 inch broad. The caryopsis (fruit) is brown, shining, ovoid, a quarter of an inch long. This bamboo is widely spread and very common throughout India and Burma. In the Panjab it is confined to the sub-Himalayan tract. It extends to Java, but not to Ceylon. "The "species occasionally flowers gregariously, but generally single stems "only or single clumps are found in flower" (Gamble). The stems that have flowered die after the seed ripens.

Sir Dietrich Brandis, in the work already cited, states that the stems of the Male Bamboo attain to 20 or 40 feet in the Panjab, in South India to 30 to 50 feet, while on moist ground they may attain to 100 feet. The stems grow to their full height in a few weeks at the commencement of the rains; in the Panjab they do not, however, harden fully during the first year. These stems are strong and elastic; they are much used

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* But why Male it is difficult to say. In the structure of the flower this species possesses nothing exceptional that would account for the name, and it bears seeds freely.

for roofing, basket and wattle work, and they make excellent lance-staves. In the bamboo forests of the Panjab and the North-West the different sizes and descriptions of this bamboo are classified under a multitude of names.

The analysis of the grain made by Professor Church is as follows :—

Dendrocalamus strictus.

The grain of this bamboo, after separation of the husk, gave, on analysis, the following results in 100 parts :—

Water	13·9
Albuminoids	11·5
Starch, &c.	66·3
Oil	1·4
Fibre	5·9
Ash	1·0

It should be stated that the above per-centage of albuminoids has been calculated on the usual supposition that the whole of the nitrogen present in the grain exists in the albuminoid form. But the coagulable albuminoids, as estimated by the "phenol-method," amount to 10·6 per cent. only—a difference which is not an unusual one. The ratio of albuminoids to carbohydrates plus the starch—equivalent of the oil—will then be 1 : 6⅔ instead of 1 : 6. These figures are very near those given by *Bambusa arundinacea** and *B. Tulda*,† which the present species closely resembles in chemical composition and food-value. Its husked grains are, however, smaller than those of *B. Tulda*, but are larger than those of *B. arundinacea*, as shown in the following table :—

Bambusa Tulda	- - -	70	husked fruits	weigh 100 grains.
Dendrocalamus strictus	222	,,	,,	,,
Bambusa arundinacea	300	,,	,,	,,

There is more oil, but also more fibre in this grain than in that of the other bamboos to which reference has been made.

A. H. C.

CXXV.—RAMIE OR RHEA.

(*Boehmeria nivea*, Hk. & Arn.
Boehmeria nivea, var. *tenacissima*, Gaud.)

The report on the results of the trials of machines and methods for decorticating Ramie stems, held at Paris on the 23rd September 1889, was published in the *Bulletin* for last month (p. 268).

It is evident from this report that considerable progress has been made towards a solution of the problems involved in the treatment of Ramie fibre, and it remains for those interested in the subject in India and the Colonies, to initiate locally such further experimental trials of

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* Food Grains of India, p. 102.
† Kew Bulletin, December 1887, p. 8.

machines and methods as will determine, with an abundance of green stems at hand, whether Ramie fibre can now be made available for commercial enterprise.

The Foreign Office has communicated the following letter addressed to Lord Lytton, Her Majesty's Ambassador at Paris, by Mr. J. A. Crowe, C.B., Commercial Attaché for Europe, respecting the results of the trials of Ramie fibre machines :—

My Lord, Paris, October 29th, 1889.

With reference to Lord Salisbury's Despatch (No. 124 of the 23rd instant), on the subject of the awards and official reports in the matter of Rhea fibre-cleaning machines at the Universal Exhibition, I have the honour to enclose copies of the general list of awards which has just been made public, to which I have added a list of the special awards for decortication of Ramie fibre.

The [official] reports which have been asked for will probably not appear, so I hear from Mr. Berger, till some time next year.

I have, &c.

(Signed) J. A. Crowe.

[Enclosure.]

Exposition Universelle, 1889.

Concours de Décortiqueurs pour la Ramie.

First Prizes.

P. A. Favier, Société la Ramie Française, 14, Rue Saint-Fiacre, Paris [for machines for treating Ramie stems].

Norbert de Landtsheer, 2, Place des Batignolles, Paris [for machine for treating Ramie stems].

Second Prize.

Ch. Crozat de Fleury et A. Moriceau, Villieurs-le-Bel, Seine-et-Oise [for process for the treatment of green Ramie stems in the field].

In regard to M. Favier's machines, which were awarded a first prize for cleaning green Ramie stems, this gentleman, well known as having devoted during the last 10 years much time and attention to the development of Ramie industry in France, Spain, and other countries, has forwarded further particulars, of his machines to supplement those already given in Mr. Morris's Report :—

M. Favier to Royal Gardens, Kew.

Paris, 14, Rue Saint-Fiacre,

Sir, 11th November 1889.

I have duly received a copy of the *Kew Bulletin* of miscellaneous information, which you have been good enough to send me, and I beg to thank you for the compliment.

Since the trials upon which you have reported I have added some improvements to my machine, to prevent the ribbons from being entangled in the rollers, and on the 23rd October I carried out further

experiments in the presence of numerous people interested in the subject.

I passed through my machine, with two workmen, 100 kilos. of green stems, more or less with leaves, in 12 minutes. This is equivalent to 5,000 kilos. of green stems (and assuming the rate of yield at 5 per cent. of dry ribbons) to about 550 pounds (avoir.) of dry ribbons per day of 10 hours. With the full complement of four workmen necessary to do justice to the machine it will work off 7,500 kilos. of green stems, and give a return equivalent to 775 pounds (avoir.) of dry ribbons per day of 10 hours. The ribbons, as you saw at Paris, are perfectly free from pith and wood.

The intricate nature of my machines, to which you allude, is only apparent. They consist really of repetitions of similar parts of crushers and rollers, weighing 10 or 12 kilos. each, so arranged that they can be easily taken in and out. The work of putting up these machines is very simple, and they can be easily regulated by anyone.

The little power required to drive my machines (three-quarter horse-power) clearly indicates that the several parts are not heavy to move, and that there is really nothing in them cumbersome or involving strain on the fibre as in other Ramie machines hitherto produced.

* * * *

The cost of my machine (for treating green Ramie stems) will probably be 80*l.* to 100*l.*, with a royalty, which is not yet fixed.

I have, &c.

(Signed) P. A. Favier,
Directeur de la Société "La
Ramie Française."

D. Morris, Esq.

At the date of the publication of Mr. Morris's report, the demand for Ramie ribbons in the London market was so slight that the prices quoted may possibly have offered little inducement for embarking in Ramie growing in the Colonies.

The information received from Messrs. Ide and Christie, in a letter dated 29th October 1889, was as follows:—

"There is very little inquiry for ribbons at present, and we do not "think they would fetch more than 8*l.* to 10*l.* per ton. We may "confirm our circular report by simply saying 'Nothing doing.'

"There are some parcels of highly prepared Ramie in London just "now, some of Indian and some of English manufacture, the values of "which range from 28*l.* to 50*l.* nominally. Those are on sale, but the "demand is almost *nil.*"

Since that time, however, it appears that a considerable improvement has taken place in the price of Ramie ribbons, and Messrs. Ide and Christie, in a letter dated the 5th November last, were able to report as follows:—

. . . . "During the past week some considerable investment "has taken place in Ramie; the whole stock in London of ribbons has "been sold at prices ranging from 14*l.* to 16*l.* per ton, and a good "deal of this was out of condition and somewhat perished. We believe "that this stock has gone into consumption by English manufacturers. "There is an enquiry for further parcels, and we are now disposed to "think that the bases of a real trade in the article are in process of "formation. At least we feel sure there are buyers in the market of "100 tons of ribbons up to 12*l.* per ton, and we could not perhaps "have said this a few months ago."

In Messrs. Ide and Christie's monthly circular, dated 15th November, it is stated :—

"*China Grass.*—Improved inquiry, and a large turn over has occurred " from 30*s.* to 34*s.* [per cwt.].

"*Rhea.*—Stocks of raw ribbons cleared out up to 16*s.* [per cwt.]. " Market bare, with plenty of inquiry."

It may be mentioned that the remarks on the Papleux system, which appeared at p. 276, may be supplemented by the information that Messrs. W. H. Spencer & Co. are associated with The Boehmeria Company, Limited, at Hitchin, Herts, formed for the purpose of converting Ramie and other textiles into yarns.

CXXVI.—COOL CULTIVATION OF TROPICAL AND SUB-TROPICAL PLANTS.

Horticulture is essentially an empirical art. Botanical science can afford but little *à priori* information as to the cultural conditions which any given plant will require or will tolerate; these for the most part can only be found out by trial and experience.

There can be no doubt that owing to this circumstance very great mistakes are made in the treatment to which newly introduced plants are subjected even in botanic gardens. This is peculiarly the case with plants coming from the tropics, as in a large proportion of cases we have no exact knowledge of the altitude at which they grow, or the range of temperature to which they are exposed naturally. It is only necessary to reflect for a moment on the various conditions of vegetation presented in the case of Kilima Njaro, a snow-clad mountain close to the equator, to see that a plant from the tropics may be suited to any conditions from those that are really tropical to those that are even rigorously alpine. But too often there is nothing, in the absence of exact information as to the conditions under which a plant actually flourishes, to give any clue to these conditions. Take the case of Brazilian Tree Ferns. There is nothing in habit or botanical characters to show which of these require cool and which hot treatment; and it is not till one has succeeded in killing a good many by the latter that one begins to wonder whether the former might not be worth trying. And yet it is hard to rid oneself of the prepossession that plants from the tropics must be best treated by heat and moisture and that there is something almost irrational in giving them anything else. Mr. H. J. Veitch, in an able paper recently published in the Journal of the Royal Horticultural Society, has shown by what slow steps cool treatment for orchids has been gradually established. "Epiphytal orchids," he remarks, "were " poured into the country in a continually increasing stream, only too " often to tantalise the purchasers with a sight of their lovely flowers " and curious forms, and then to languish and die. For more than " half a century England was, as Sir Joseph Hooker once observed, " 'the grave of tropical orchids.' "

It might have been expected that the same thing would be found to be true of other kinds of plants, and in some measure this is found to be the case. For some years past I have been compelled to scrutinise the collections in the Palm House at Kew in order to see where space could be found for the development of the profusion of new and interesting

species of palms which we have now accumulated. And I have not hesitated to transfer to the Temperate House plants which I thought would probably endure a lower temperature. I did not expect to find, as has proved to be the case, that many of them luxuriated in the change. The Temperate House, as its name indicates, had previously been dedicated to the plants of warm temperate countries, which were incapable of surviving our English winter in the open air. It appeared to me that its interest might be greatly enhanced by introducing freely into it sub-tropical types of vegetation.

Now, nowhere have plants of this kind been made the subject of experimental cultivation on so vast a scale as on the Riviera. The exceptional conditions of its climate have tempted persons possessed of horticultural tastes and considerable wealth to try freely in the open air a great variety of plants, ordinarily in Europe only to be seen in cultivation under glass. It seemed obvious that a great deal might be learned by taking stock of the results which had been actually accomplished, especially in private gardens. I therefore applied to the First Commissioner of Her Majesty's Works and Public Buildings for leave to send the able Assistant Curator of the Royal Gardens, Mr. Watson, to the South of France to report upon what he was able to observe. To this the Board assented; and the result of Mr. Watson's mission is contained in the following pages. They are published in the hope that they may be useful to others beside the staff of the Royal Gardens.

W. T. T. D.

Kew, 25 November, 1889.

The gardens of the Riviera have become famous for the large number of exotic plants, many of them even tropical, which are cultivated there with astonishing success in the open air. Probably in no other part of Europe are the conditions so favourable to real and varied sub-tropical gardening as in that narrow strip of country which extends along the northern border of the Mediterranean from Hyères to Genoa.

Reports of what these gardens contained have appeared from time to time in horticultural and other journals, but these were either too discursive or fragmentary to enable one to form any correct idea as to what was grown and how it was accomplished. It was therefore decided that I should visit some of the principal gardens of the Riviera for the purpose of seeing what succeeded best in somewhat similar conditions. This I accordingly did in the latter part of October last, visiting as many gardens as possible between Hyères and Mentone in the fortnight at my disposal.

The following notes are intended to serve as a report on the most striking of the many tropical and sub-tropical plants noted during this journey.

First, however, it may be worth while saying a few words as to the climate and other conditions peculiar to this portion of the South of France. In the Journal of the Linnean Society, Vol. XVIII., p. 135 (1880), is a paper by Professor Allman, M.D., F.R.S., on the natural vegetation of the Riviera, in which one gets an excellent idea of the characteristic features of those parts which I visited. I take the liberty to quote from this paper the following paragraphs :—

"Nowhere in Europe is there a region which, in winter and spring, basks
" under the rays of a more genial sun, where its mountain barriers more
" thoroughly defend it from the icy winds which sweep over the unpro-
" tected plains of the north; and when the season of rains is at an end,
" there spreads over all this sunny land an atmosphere of absolute
" transparency; while away upon its extreme southern boundary lie the

" waters of the Mediterranean, flowing round wooded crags and " picturesque headlands, and gleaming with an intensity of blue ap- " proached by that only of the cloudless sky which stretches over all.

" When we seek for the conditions which give to the flora of the " Western Riviera a character so essentially its own, we find a climate " remarkable for the mildness of its winters and the high temperature " and dryness of its summers. It is thus neither a purely insular nor a " purely continental climate; for the cool summers and the rigorous " winters of the latter are here equally absent.

" No less peculiar is the distribution of rain throughout the year. " The season of rain is confined to the winter and spring months, while " the summer is, as a rule, absolutely rainless.

" With the most important elements of climate thus distributed, a " well marked influence must be exerted in determining the periods of " active vegetation. After the winter rains have supplied the humidity " essential to the perfect development of vegetation, there bursts upon " the whole country with the coming spring a richness of foliage and of " blossom as beautiful in its forms and in its colours as it is marvellous " in its suddenness. And then, when spring is succeeded by the hot " rainless summer, vegetation becomes arrested, and the freshness of " the spring landscape is gone; for even the evergreens become dull " and lustreless under the increasing heat and aridity of summer."

The annual rainfall in most of the Riviera stations is about the same as that of Greenwich, viz., 25 inches. The whole of this rain, with the exception of an occasional thunderstorm in summer, falls between September and April. The mean winter temperature (November, December, and January) is about 47° Fah. Occasionally the thermometer goes down to freezing point, and sometimes, though rarely, four or six degrees of frost are experienced. This occurred in Cannes last year, when some of the more delicate plants were injured by the cold. In the gardens at Villa Valetta several palms, cycads, and ferns were pointed out as having been injured by the cold of last winter. These will be referred to again. The same amount of cold was felt at Nice, where, in the gardens of the Floricultural Society, many plants were damaged by the frost. In 1887 no less than 11 degrees of frost were experienced in this garden, when many plants, usually hardy there, were killed. Some interesting particulars in regard to the effects of a low temperature on various plants were communicated by the manager of these gardens; these will be given under the respective plants in the list which follows. In Mentone the thermometer rarely falls below freezing point. " Two or three times in the winter the thermometer goes down for a " night or two to 38°, 36°, 34°, or even to 30° in exposed situations " (Bennett).

The same circumstances which make the winter temperature of the Riviera comparatively high have a like effect on the temperature in summer. Gardeners and others, who are there all through the summer, find the temperature often very trying. The fierce heat of the sun, untempered by wind, and the excessive drought, make good gardening very difficult. Many of the plants, large specimens as well as small, require daily drenching at the roots. It is impossible to keep a turf of any kind, the beautiful stretches of green grass which are to be seen in the winter being the results of annual sowings in autumn. At this time the ground intended for grass is dug over and trodden down very firmly, otherwise the heavy rains would wash it into disorder. The grass I was told is entirely rye-grass, and the best seed is reputedly Scotch. It is sown thickly and kept watered until the rains come. Some plants were pointed to as being crippled by the excessive sun-heat in summer.

One of these was *Cycas revoluta*, the leaves of which were scorched. This is one of the commonest, in fact the only common species of cycad which we saw, and very few were healthy. The following tables, copied from Dr. Bennett's book "Winter and Spring on the Shores of the "Mediterranean," will afford some idea of what the summer heat is like in some of the stations of the Riviera :—

	Mean Temperature of Seasons.			
	Winter.	Spring.	Summer.	Autumn.
Mentone - - -	49·5	60·	73·	55·6
Toulon - - -	43·30	53·70	74·30	59·
Genoa - - -	44·57	58·60	75·03	62·94
Nice - - -	47·82	56·23	72·26	61·63
* Ceylon (Hill districts)	69·30	70·78	69·54	71·29
* Madeira - -	60·60	62·36	69·56	67·30
* Port Jackson (N.S.W.)	54·62	63·45	70·93	64·03
Paris - - -	38·43	50·40	64·47	52·30

* For comparison.

In attempting to account for the successful cultivation on the Riviera gardens of so many plants which have hitherto been believed to be distinctly tropical in their requirements, the extraordinary summer heat and sunshine experienced there must be considered as having a great deal to do with it. A plant which makes its growth under such favourable conditions is better able to withstand the trials of a low temperature than one which has been less favoured. This is a well-known fact in horticulture. Again, the length of the cold season is so very short, that little harm can come to plants which are so abundantly favoured in other respects. It is only actual frost that does permanent injury to vegetation. In England a tropical plant may be grown in a low temperature several years before it becomes severely injured, although exposure to a degree or two of frost would probably kill it.

The natural soil of most of the gardens visited is very porous, being formed of crumbled limestone and sandstone. When wet, it is soft and clay-like, but it soon drys and is then not unlike what gardeners know as a mixture of light loam and sand. It is considered poor garden soil, but by copious and frequent supplies of rich manure whatever deficit the soil may have is abundantly made up. In all the best gardens the use of manure is what in England would be considered excessive. Trenches are opened during the summer all round the specimen trees and shrubs, and into these are poured cesspool manure, none of which is ever wasted. I was told that a cartload of this was not considered too much as an annual supply for a large palm. The gardens as a rule are not kept dressed during the summer, most of the owners being at that time elsewhere. This enables the gardeners to perform the rough work, such as manuring, trenching, &c., with thoroughness and ease. Watering is at this time a heavy task. The gardens are mostly on steep slopes or terraced, consequently the water drains away quickly, so that unless the soil is frequently drenched the vegetation would soon suffer. This circumstance must favour those plants which are impatient of 'sourness' or stagnation at the root. Of course many of the plants cultivated on the Riviera would not thrive if

planted in a soil which is principally of limestone formation. Such plants as azaleas, camellias, many Australian trees and shrubs and others which require a peaty soil, can only be grown in beds specially prepared for them. In Mr. Hanbury's garden at Mentone there are hundreds of these peat-loving plants, most of them in good health. The porousness of the natural soil will also be favourable to these, as peat so soon decomposes and becomes putty-like unless well drained.

All these gardens are within a short distance of the Mediterranean. This sea contains an unusually large proportion of salt in solution. I was surprised therefore to learn that the effects of the salt are not appreciable in the gardens, no plants appearing to suffer from it. Having seen and heard much of the injury done to plants growing near the sea by salt blown up during windy weather, I naturally expected to see signs of its ill-effects in the Riviera. Probably cases would have been found had further inquiry been made, but it is a fact that I neither heard of nor saw any.

Among the plants which have been introduced, the palms form by far the most prominent feature in the towns of the Riviera. The beauty of many of the gardens is largely due to the effect produced by groups or large specimens of palms of various kinds. In some of the towns and especially Hyères, the streets are planted with *Phœnix dactylifera*, the common Date, its tall straight stem, 30 or more feet high in some instances, crowned with a huge head of grey-green arching leaves. The effect produced is monotonous and rather depressing, but it could be easily improved by the addition of some such trees as Eucalyptus, Acacia, Evergreen Oak, or even Plane. Hyères might be named the town of Palms, so numerous are its date trees. In Bordighera this palm is extensively cultivated for the sake of its leaves, which are sold to Roman Catholics and Jews for the decoration of churches at Easter, and for the feast of Tabernacles. The whole of the head of leaves is tied up tightly in the autumn so that the inner leaves may bleach. At the time of my visit there was scarcely a date tree in the town that was not tied up in this way.

Almost as striking and as plentiful as the Date are *Phœnix canariensis* and *Washingtonia filifera* (Pritchardia filamentosa). The former is said to have been first introduced into the gardens of Baron Vigier at Nice about 20 years ago, where the two parents of all the plants of this palm now on the Riviera are still in existence. It is a palm of very rapid growth, of gigantic proportions and much more ornamental than the date palm, or indeed than any of the species of Phœnix grown there.

Equalling the Canarian Phœnix in its extensive use, in its proportions and in rapidity of growth, is the *Washingtonia*. The growth made by this palm on the Riviera is astonishing, and it appears to thrive equally well in all the stations. There must be hundreds of thousands of plants of it in the gardens and nurseries visited, and the prices asked show that there is a great demand for it.

After these, the palm which ranks next in popularity is *Chamærops humilis*, which is abundant in most of the gardens and occurs sometimes as a street tree. It fruits when only a few feet high, producing annually very large bunches of bright orange fruits about the size of sloes. When writing in 1880 of the most important among the introduced plants on the Riviera, Professor Allman stated that, "It is remarkable, and not easily explained among the phenomena of distribution, "that while the southern Date Palm grows here so freely, and even "ascends to some height upon the hills above the coast-line, the

" *Chamærops humilis* (the truly indigenous palm of the European " shores of the Mediterranean, and still abundant in the south of Spain " and in Sicily) is nowhere to be met with." Certainly I saw thousands of it, some of them old and almost worn out. They were, however, all cultivated plants, and although there were numerous seedlings near the specimens in fruit, I have no recollection of having met with a truly wild example of this palm. As most of my time, however, was devoted to gardens and not to the wild flora, my failing to see any wild plants of this palm does not count for much.

The palms hitherto named, as well as some others seen, were easy to recognise, their characters being familiar. But there are a great many plants in the gardens of the Riviera with names which certainly do not belong to them. In some cases the errors were apparent enough, as for instance when we saw *Livistona inermis* named *Copernicia cerifera*, a Ficus of some kind called *Artocarpus incisa* and *Strelitzia augusta* labelled *S. Reginæ*. But the difficulties which give one most trouble are the different and various names which are given to what appear to be absolutely the same plants. Some explanation for this deplorable state of things is found in the fact that the gardens of the Riviera have been stocked chiefly by nurserymen, many of whom are careless in respect of names. The experience of Dr. Glaziou, Director of the Botanic Gardens of Rio de Janeiro, who has recently been staying at Kew, may be mentioned here as bearing upon this difficulty of nomenclature, and particularly in its relation to Palms. For many years Dr. Glaziou has been purchasing and planting in his garden at Rio as many palms as he could obtain from nurserymen and others. Already a large number of the plants thus procured have grown to maturity, flowered, and have been determined. Many of them, he says, proved to be wrongly named, whilst the number of those which proved to be identical, was surprising. It is desirable that useful work of this kind should be gone on with. At Kew we are conscious that the names of some of the plants, and particularly of some of the palms, are probably not correct; but they have been obtained under these names and are generally grown as such. Until they flower, however, it is impossible to deal with them satisfactorily.

One of the most interesting of the gardens visited was a branch establishment at Hyères, of the Société d'Acclimatation, in Paris. Here a good deal of what may be called experimental gardening is practised, plants of all kinds being planted and tested as to their hardiness, &c. Some of the most important of them are included in the lists which follow. The cultivation and keep generally in these gardens were first rate, and most of the plants were legibly labelled. When inspecting these gardens the idea was suggested that a well-managed botanical station, devoted chiefly to experimental testing, proving, and breeding operations amongst plants, would, if established in some such favoured locality as Hyères, be capable of much valuable work.

Mr. Hanbury and Dr. Bennett at Mentone and Professor Naudin at Antibes have done much by cultivating and distributing useful plants of all kinds from their richly stocked gardens. But there is still much to be done by the systematic botanist before the names of the plants are in harmony with the names in use at Kew.

Palms.

The number of genera represented in the list of those noted amounted to 16. I was surprised not to find any plants of such genera as *Caryota*,

Astrocaryum, *Geonoma*, *Oreodoxa*, and *Wallichia*. There does not appear to be any good reason why such plants should not thrive equally well with those already there. Probably, however, these and many other palms are unrepresented because no one has tried them.

Brahea.—The true Braheas are represented by only four species, all of them natives of Mexico. They are very similar to Thrinaxes in general appearance, and are related to them. The stems are smooth, about 30 feet high when mature, and the head is composed of short stalked palmate leaves, with a few short spines along the margins of the base of the petioles:—*B. lucida* (egregia), a fine plant in perfect health. *B. nitida*, with a stem 9 feet high, a noble head of leaves and drooping panicles, 8 feet long, of fruit and flowers; the inflorescence developes one year, the flowers open the next, and the seeds ripen the year following. Both these were in the gardens at Villa Valetta, Nice. *B. nobilis*, a fine specimen in the middle of a lawn at Monte Carlo. The blade of the leaf is 4 feet in diameter, and it is silvery on the under side. A plant at Nice, called *B. calcarea*, is evidently a species of *Erythea*, as also is the palm commonly known as *B. Roezlii*.

Bacularia.—A small genus of dwarf pinnate-leaved palms from Australia. *B. monostachya*, the walking-stick palm, was seen in the gardens of the Acclimation Society at Hyères. It was placed under a large handlight, and looked unhappy. This plant is grown in a cool greenhouse in England.

Chamædorea.—Only one species, viz., *C. scandens*, was noted. It was at Nice, and apparently quite happy, trained up the stem of a Cocos on a lawn. *C. elatior* is large and healthy in a cold house at the Jardin des Plantes, Paris.

Chamærops humilis.—A common garden plant all along the Riviera. It fruits very freely, and some of the varieties are exceedingly ornamental when bearing their enormous collar-like whorl of rich orange fruits. In no palm have I noticed so much variety as in this *Chamærops* In some the petiole is short and stout, in others long and attenuated; some petioles were armed with stout spines, half an inch long, others had short spines, and others were merely serrated. The leaf blade showed an equal amount of variation, some plants having stiff board-like leaves, others thin and drooping ones. They varied in hue from grey to deep green. In the fruit also there was variation in size, shape, and colour. It would be easy to select half a dozen plants with characters distinct enough to rank as good species. Something of the kind has been attempted, such names as *C. Biroo*, *C. Ghiesbreghtii*, and *C. tomentosa* being given to plants which are merely varieties of *C. humilis*, *C. Fortunei* (see *Trachycarpus*).

Chrysalidocarpus lutescens, generally known as *Areca lutescens*, has been tried out of doors at Nice, but it cannot be established owing to its not being able to bear the low winter temperature.

Cocos.—This genus is well represented; *C. flexuosa* being very abundant. In the garden of Villa Valetta there is a magnificent grove of it rising straight from the lawn to a height of 30 feet or more. In another place it and *Musa Ensete* were massed together. Fruiting trees were seen at Hyères, Nice, and Cannes. I was informed that this species is at least as hardy as the Date. The effect of its enormous plume-like leaves towering up above most of the other plants in the gardens may easily be imagined. The stem of one specimen measured at Cannes was 15 inches in diameter. Under the names *C. campestris*, *C. Yatai*, *C. Bonneti*, and *C. australis* are plants which apparently are closely related to each other, probably merely varieties of one

species. According to Wendland and others there are distinct species to which these names belong, but so far as I could make out it is questionable if they exist in the gardens of the Riviera. We have these badly named plants at Kew, no doubt from the same source as those on the Riviera. The manager of the gardens of the Floricultural Society informed me that, in his opinion, *Cocos campestris*, *australis*, and *Bonneti* are certainly the same or seminal forms of one species; just as the plants distinguished in gardens under the names of *Kentia Fosteriana*, *K. Belmoreana*, and *K. australis* are obtained from seeds of the same tree.

Whatever their names, however, the Cocoses named as above in the gardens of the Riviera are very ornamental, their elegant arching pinnate leaves being almost silver white; they thrive, too, as well as any of the palms grown there. *C. Blumenavii*, apparently the right thing, is also represented by fine examples in several of the gardens visited. In a cold greenhouse at Paris *C. insignis* (*Glaziova*) is apparently quite happy. An example of it is also in the Temperate House at Kew.

Erythea.—This genus comprises two species of Californian palms, with fan-shaped rigid glaucous leaves. They have not been long in cultivation, but already one of them, commonly known as *Brahea Roezlii*, is plentifully represented on the Riviera. It is sometimes called the Silver Palm, healthy plants being almost white. At Hyères, Cannes, Nice, and Monte Carlo, are some very fine examples of it, all planted as single specimens on lawns. The largest seen was 8 feet high and 8 feet through, the stiff leaves forming a grand mass from the ground to the top. Another plant met with under the name of *Brahea calcarea* is either a form of *E. armata* (the correct name for *Brahea Roezlii*), or is the second species, viz., *E. edulis*.

Howea.—The two plants commonly known as *Kentia Fosteriana* and *K. Belmoreana* are now placed in the genus *Howea*. They are merely forms of one species, as is pointed out under t. 7018 of the Botanical Magazine. Small plants of these and of *K. Lindeni* and *K. Canterburyana* were noted under handlights in the garden at Hyères; also a large specimen of *H. Belmoreana* at Cannes, and quantities of young plants out of doors at Nice. So far, however, all efforts to establish them have failed, as they cannot endure the winter temperature. Our experience at Kew in the cultivation of all the Howeas is that they must have a tropical temperature at all times.

Jubæa spectabilis, the Coquito Palm of Chili.—Several fine examples were seen, notably one in the garden of the Villa Thuret, at Antibes. A magnificent specimen of this palm is a conspicuous object in the Kew Temperate House.

Livistona.—The common garden species of this popular genus are plentifully represented in the gardens visited. *L. australis* (*Corypha*) occurs in many places, and some of the specimens are very large trees, with stems as thick as that of the *Washingtonia*. A grove of many large plants of *L. sinensis* (*Latania borbonica*) formed a magnificent feature in the gardens of Villa Valetta. *L. mauritiana*, which is probably merely a variety of *L. sinensis*, is also represented by large plants at Cannes. The most interesting plant of this genus, however, is a very fine example of the rare *L. inermis*, of R. Brown, in the gardens of Villa Valetta. It has a bare stem 6 feet high by 1½ feet in diameter at the base. The head is made up of a large number of shining green leaves, the petiole of which is 6 feet long and margined with spines at the base. The blade is divided almost to the base, and it has a distinct midrib which is curved so as to produce a very

extraordinary effect. The form of the leaf may be called a combination of the pinnate and palmate characters. A plant of this rare palm is in the Kew collection; there is also a fine example of it in the collection at Blenheim. A large specimen was also noted in Baron Vigier's garden at Nice. Mr. Bull distributed plants of it some years ago under the name of *Corypha decora*.

Phœnix.—Of all palms the cultivated species of *Phœnix* are the most difficult to define. There is abundant evidence to show that a considerable number are of hybrid origin, or mongrels, bred by accident in gardens. In some of the gardens of the Riviera, for instance, there are numerous kinds of *Phœnix* all growing together, and many of them flower and fruit annually. Being diœcious, seeds are not produced unless the pollen is blown or carried by bees, &c. from the male to the female plant. Under these circumstances it appears to me next to impossible for the progeny of these cultivated palms to be pure. Besides this fact there is also that of the cross-breeding among Phœnixes practised by the gardeners of the Riviera. Count Kerchove, in his book "Les Palmiers" (1878), gives as an example of the wonderful fecundity of a *Phœnix* the case of a *P. reclinata* which at Nice had been fertilised with pollen from *P. tenuis*, *reclinata*, and *pumila*, and produced 20,000 seeds! Several plants bearing seeds which were the result of crossing one kind with another were pointed out to us at Cannes and elsewhere. Mr. Scott, Curator of the Royal Botanic Garden, Calcutta, hybridised, previous to 1879, several species of *Phœnix*. The names of these plants, therefore, are not to be relied upon. I give a list of those noted :—

P. canariensis; no doubt of hybrid origin.
P. cycadifolius; very like *P. sylvestris*.
P. dactylifera; the ordinary date.
P. humilis; certainly not *P. humilis* of Royle; probably *P. reclinata*, or a hybrid.
P. leonensis; no doubt *P. spinosa* of the Cape.
P. paludosa; certainly not that species, but not unlike *P. reclinata*.
P. reclinata; not always true.
P. senegalensis; identical with what we know as *P. reclinata*.
P. spinosa.
P. sylvestris.
P. Vigieri; a synonym of *P. canariensis*.

These were the named plants. In addition, there are many without names and which were mostly very mongrel-like in appearance. *P. canariensis* is the most useful of all. The largest specimens seen were a pair, male and female, in the garden of Baron Vigier, at Nice. They each have a clear stem 12 feet high and 4 feet in diameter. The leaves are very large, probably 20 feet long, gracefully arched, and bright green; they form a head 30 feet through. These two plants are said to be the progenitors of all the plants of *P. canariensis* in the Riviera. I was informed by the gardener that they were 20 years old, and that they had originally come from the nursery of Messrs. Verschaffelt, of Ghent. The rate of growth of this species is surprising. Here are the dimensions of a plant said to be not more than 10 years old:—Stem, 4 feet high, 3 feet in diameter at base; number of leaves, about a hundred, forming a magnificent head 25 feet across. Another specimen, about the same size, bore eight huge bunches of fruit, each bunch about half a hundredweight; the fruits, which contained fertile seeds, were about as large as sparrow's eggs; the seed is larger than that of any Phœnix known to me. It is said that this Phœnix bears cold better

than *P. dactylifera*. The raising of these Palms from seeds is done on a large scale, and thousands of small plants, 2 or 3 feet high, are sent annually to Paris and other towns for use in the decoration of saloons. The seeds are sown in beds in the open; the seedlings are pricked off in shallow trenches in the same way as celery is planted here. This is done as a precaution against drought, as the trenches can be regularly flooded in summer.

P. rupicola had been tried at Cannes, but it perished in the winter temperature.

Rhopalostylis. — Both species are represented in several of the gardens visited. They are commonly known under the names of *Kentia* (or *Areca*) *sapida* and *Baueri*. The former was uninjured by 6 degrees of frost.

Sabal.—Some very fine specimens of several species of *Sabal* were noted. At Hyères, Cannes, Antibes, and Nice, *S. Blackburniana* (of which there is a noble specimen in the Palm House at Kew), is represented by large examples in perfect health. *S. Adansoni*, *S. havanensis*, *S. Palmetto*, *S. umbraculifera*, and one called *S. Ghiesbreghtii*, were also noted. No doubt all the species of this noble genus could be established in the Riviera.

Seaforthia elegans.—A small plant under a handlight, at Hyères, and a beautiful specimen, 20 feet high, in perfect health, on one of the lawns at Villa Valetta. Considering the ornamental character of this palm, its popularity and its hardiness, it is surprising that only these two examples of it were noted.

Trachycarpus (*Chamærops*) *Fortunei*.—A grove of large plants at Cannes, and a very fine specimen, 20 feet high, at Nice; this palm is quite hardy at Kew.

Trithrinax.—Under the name of *Thrinax Chuco*, several fine plants were met with. The manager of the Floricultural Society, at Nice, where a number of plants are grown, stated that the cold of 1887 (11 degrees) did not hurt this palm.

Washingtonia.—One of the glories of the Riviera. It is a native of California, where it is known as the Desert Palm. It was first brought to notice by Dr. C. C. Parry, who discovered it in 1849–50, but it does not appear to have been named until 1860, when it was called, *Brahea dulcis*?, Wendland afterwards placed it in *Pritchardia*, and finally founded the genus *Washingtonia* upon it. Apparently, it was not introduced into European gardens until 1875, and is, therefore, a comparatively new palm. Notwithstanding this, there are some very large specimens of it on the Riviera, where it is known by the name of *Brahea filifera*, or *Pritchardia filamentosa*. I could not see any characters in the plants pointed out as *W. robusta* to distinguish them from *W. filifera*; the reddish hue of the base of the petiole appears to be the principal difference.

At Villa Valetta, on a sloping lawn in front of the house, is a grove of about 60 magnificent specimens of this palm, to me a marvellous sight. Most of these plants had huge onion-shaped stems, 10 feet in circumference at the base, and about 10 feet high, some even higher. The crown of foliage was 20 feet through, and was composed of from 50 to 80 leaves, each with a stout armed petiole, 5 feet long, a blade 4½ feet across, and ornamented with numerous white drooping filaments, a foot in length. The general aspect of the largest was very similar to that of *Sabal Blackburniana*, in the Palm House at Kew. I was assured that the largest of these plants was not more than 12 years old, and from the date of the introduction of the species this cannot be

far from correct. The rate of growth in this palm must, therefore, be astonishing. At Nice I saw a specimen the stem of which was 15 feet high. In exposed situations and within a few yards of the sea, this palm is perfectly healthy.

Cycads.

The fewness of the Cycads met with was disappointing. I believe that everyone of the African and most of the Australia species would thrive on the Riviera. Mons. Dognin, whose garden is the richest in beautiful and rare plants, and the most perfectly planned I have ever seen, arranged a group of Cycads against a large bank of stones, planting with them large Bromeliads, Aloes, Opuntias, Agaves, &c., and backed with large Magnolias, *Persea*, *Cocos* and tall massive Bamboos. All the Cycads are in good health, their names being as follow :—

C. siamensis ; a large stemmed specimen with a fine head of leaves.
C. revoluta ; healthy in shade.
Dioon edule.
Encephalartos Altensteinii.
„ *horridus.*
„ *Lehmanni.*
„ *villosus.*
Macrozamia spiralis.
„ *Macleayi.*

In the same town, Cannes, there are also good healthy plants of *E. Caffer* (E. longifolius) and in Mr. Hanbury's garden at Mentone there is a fine example of *E. horridus*, var., which bore three fine cones at the time of my visit. *Dioon edule*, on the lawns at Monte Carlo, was in fine health, but *Cycas revoluta* was unhappy.

Bamboos.

After the Palms, the most tropical feature in the gardening of the Riviera is the Bamboos, which are largely used in the composition of the best gardens, both public and private. To a northern gardener the elegance and grandeur of some of these Bamboos constitute some of the chief charms of the Riviera. Some of the specimens are of very large dimensions, as for instance one of *B. vulgaris*, in Baron Vigier's garden at Nice, which measures 40 feet through in every direction and is 35 feet high. It contains hundreds of stems or canes, each 3 inches in diameter, and straight and smooth as a gun barrel. It is planted on one side of the lawn near the house. As fences, screens, and boundary lines the Bamboos are frequently used, and nothing could be better, as they are quick growers and evergreen. All the kinds noted were in splendid health, and from the manner in which they had taken possession of the ground, it was evident that their requirements are abundantly satisfied. The finest and healthiest examples are in wet ground, often on the edge of water. Most of them are heavily manured annually.

In England we have not hitherto made the most of this beautiful family of plants, many of which may be grown out of doors successfully in all the milder parts of the country, whilst in large conservatories, where they would get protection from cold in winter, a still greater number would be found to thrive. That they are much superior to

many of the plants at present used for such positions must be evident to anyone acquainted with the extraordinary elegance and grace of a well-grown Bamboo.

The Kew collection comprises over 50 named sorts, a few of which are tropical, whilst the bulk of them are either quite hardy or require only the temperate conditions supplied by the winter garden.

The names of Bamboos are as confusing as are those of garden palms. In one as in the other it is only very rarely that the plants flower under cultivation, so that many of the names, which are given by nurserymen, can only be problematical. For garden purposes this would not be of much consequence, the difficulty arising only when growers do not agree as to what names the plants shall bear.

Now that so many kinds of Bamboo are in cultivation under favoured conditions on the Riviera, it would be worth while to watch them, and as they flower, get them properly determined.

It is generally supposed that nearly every member of the Bamboo order perishes immediately after flowering. There are many recorded instances of this having occurred. But with regard to a considerable number of the species the exact flowering age has not been ascertained. Some are said to grow 40 years before flowering. Another remarkable fact is that all the plants of one generation flower at the same time, no matter how different may be the conditions in which they happen to be placed. I was told that all the plants of *Thamnocalamus Falconeri* (Bambusa gracilis) of the Riviera flowered and died last year. Numerous seedlings have since sprung up about the old stools, but the latter certainly all perished. This proved to be the case with a plant of *Arundinaria falcata*, which flowered at Kew in 1886.

The following are the kinds noted. The names in brackets are what I consider to be the correct names, according to Munro, &c.

B. aurea, Sieb.—A Japanese species, now well known in gardens. It was in cultivation at Kew in 1866, and is here still. It is one of the most elegant of the hardy Bamboos. In the gardens of the Acclimatisation Society at Hyères there is a magnificent specimen with stems 25 feet high, and not more than 1½ inch in diameter. The nodes are prominent, and less than 4 inches apart on the lower part of the stem. When ripe the stems are of a rich greenish-yellow colour. The leaves are small, with a distinct petiole.

B. gigantea (Dendrocalamus giganteus, *Munro*).—The largest of all the Bamboos. The specimen in the Palm House at Kew produces stems 40 feet long and 12 inches in circumference, but wild plants have stems as much as 26 inches round. In the garden at Villa Valetta, Cannes, there is a very fine mass with stems 30 feet high and 4 inches in diameter. It is a native of India.

B. gracilis (Thamnocalamus Falconeri, *Hook. f.*).—A slender and somewhat fragile stemmed plant from the Himalayas. It is not uncommon in gardens as it makes an elegant pot plant. It was plentiful on the Riviera till last year, when all the plants flowered. There is a plant at Hyères called *B. gracilis rustica*, in which the leaves are narrow, with incurved margins.

B Mazelii, Hort.—A fine mass at Hyères and Cannes. The stems are 25 feet high, bright yellow when mature, the nodes prominent and close together at the base, the branches loose, and the leaves short and twisted on the petiole. It looked suspiciously like *B. aurea*.

B. Metake (Arundinaria japonica, *Sieb. & Zucc.*).—Much used on the Riviera, where it is as ornamental as it usually is in England. It is always strongest when grown near water, although it grows well in

an ordinary border. At Kew there is a specimen 12 feet high. According to Munro it is known as *B. mitis* in the gardens of Paris.

B. mitis, Poir.—A magnificent specimen on the lawn at Villa Valetta, the stems 30 feet high and 3 inches in diameter at the base, becoming shining yellow with age. The nodes are prominent and about 9 inches apart, the leaves short and not dense. There is a small plant of it at Kew, obtained last year from Lavallée's collection. It is said to be from Cochin China.

B. nigra (Phyllostachys nigra, *Munro*).—A clump of this, 20 yards through and rising to a height of 30 feet, in the garden of Baron Vigier at Nice, was one of the most striking objects seen on the Riviera; thousands of naked shining blackish purple stems rising from the lawns and losing themselves in the mass of green foliage above. This species is quite hardy in England, but it does not grow to its full height except when in a very sheltered situation or under glass, as at Chatsworth, where in the large conservatory it is exceedingly handsome.

B. quadrangularis, Fenzi.—A very interesting species from China, with stems 15 feet high by 1 inch in diameter, and distinctly quadrangular; the nodes are armed with decurved teeth-like spines. These dimensions are of a clump 6 feet through on one of the lawns at Villa Valetta. There are plants at Kew, both outside and in the Temperate House. It is a handsome and distinct Bamboo. For an account of it, see an article in *Nature*, vol. xxxii. (1885), p. 391.

B. Quilloi.—I cannot find any information with regard to this plant. Carrière described a Bamboo in the *Revue Horticole*, under the name of *B. Duguilioi*, but Munro appears to have referred this to *Phyllostachys puberula*, included by him under *P. nigra*. The plant known under the above name is represented at Hyères by a large clump with stems 25 feet high, 1½ inch in diameter, bright yellow, with a faint tendency to become quadrangular. We have a plant of it at Kew. It is a most elegant Bamboo.

B. scriptoria, Hort. (B. nana, *Roxb.*).—I believe that *B. scriptoria* of the Riviera gardens is merely a form of the well-known Chinese *B. nana*. It has the same dense habit, thin green canes, and small leaves with the underside glaucous, which characterise *B. nana*. In some of the specimens seen the stems were 9 feet high. A variegated form called *B. scriptionis* is the same as is grown at Kew as *B. nana variegata*.

B. Simoni, Carr.—A beautiful Bamboo, and perfectly hardy in England, as is shown by the fine example in the Cambridge Botanic Garden, and by the plants at Kew. It is also very handsome at Hyères, where the canes are 15 feet high, quite smooth and cylindrical, less than an inch in diameter, and coloured deep olive green. This plant is worth the attention of English horticulturists on account of its elegance and hardiness, and its evergreen character.

B. sulphurea.—Apparently a garden name for a very handsome Bamboo, with stems 18 feet high, 1½ inch in diameter, the nodes 9 inches apart, and the internodes deeply furrowed on one side. When mature the stems are a rich orange yellow colour. There is a fine mass of it at Villa Valetta. It is also in the Kew collection.

B. verticillata.—This is probably the "Male Bamboo" (Dendrocalamus strictus, *Nees*), a common Indian species, the stems of which, according to Munro, are universally used as lance-staves. The specimens seen were large clumps, the stems 20 feet high, 1 inch in diameter, the nodes at the base a foot apart, the upper ones bearing each a

crowded cluster of short leafy branches. When old, the stem is bright yellow. It is a well marked handsome Bamboo.

B. violescens, Carr. — A beautiful Chinese Bamboo, which was introduced into the Jardin d'Acclimatation in 1870, in the branch of which at Hyères a fine clump was noted. The stems are 10 feet high, ¾ inch in diameter, much branched towards the top, the internodes somewhat flattened on one side, and striped with violet on a greenish yellow ground. The leaves are glaucous on the under side. Young plants of it are in the Kew collection.

B. viridi-glaucescens, Hort.—One of the handsomest of cultivated Bamboos. It is quite hardy in England, and in France it is one of the commonest. It grows very rapidly, has handsome foliage, transplants easily, and is a first-rate pot plant. It is frequently used in France for the embellishment of entrance halls, and is very effective. The stems of the Riviera plants were over 20 feet high, very slender, the nodes about a foot apart, dark green when young, bright yellow when mature.

B. vulgaris, Wendl. (B. Thouarsii). — Some astonishingly large healthy specimens of this well-known species were met with. Apparently it does not require tropical treatment such as it usually gets. At Hyères, Cannes, and Nice, it is especially fine; in the last-named place measuring 40 feet through, and the canes 35 feet high. The plant in the Palm House at Kew must be 30 years old; it has not yet flowered.

Agaves and other Succulent Plants.

The excessive heat and drought of the summer, alternating with the moisture and mildness of the winter on the Riviera, afford exactly those conditions which are especially favourable to the majority of succulent plants. South Africa, Mexico, and the most southern of the States of North America are the homes of the greater portion of these plants, and the nature of the seasons there is very similar to what we meet with on the Riviera. Consequently we find such plants as *Agave*, *Aloe*, *Furcræa*, *Yucca*, *Beschorneria*, *Dasylirion*, *Opuntia*, and other kinds of Cacti, abundantly represented there, and thriving, at least, as well as they do in their native haunts. The cultivation of such plants must, therefore, be attended with infinitely less trouble and expense than that of Palms, for instance, so many of which require to be frequently and heavily watered during the hot dry summer months. Agaves and Opuntias appear to have run wild in some parts, whilst those in gardens, where they receive a little care, attain often marvellous proportions, and are really magnificent objects. Opuntias are employed in the composition of the beautiful garden at Villa Valetta with the most admirable results. *O. maxima*, a huge specimen, 18 feet through and 12 feet high, its joints 20 inches long by 14 inches wide, coloured milk white with pure white spines, and bearing numerous large purple fruits. This was on a lawn of rich green, and had as a kind of frame work the deep green plumes of *Cocos plumosa* and elegant bamboos. *O. armata argentea*, here and also in Mr. Hanbury's garden at Mentone, is a cylindrical stemmed species, and forms a mass 6 feet through and a foot high, the stems so thickly covered with spines as to be completely hidden. And these spines, which are fully 2 inches long, are each enclosed in a sheath of the purest white. Lying on the top of a mass of stones, the effect produced by this plant is delightful. Those who have learnt to despise

Cacti as ornamental plants should see them as they appear on the Riviera.

Agaves are equally grand. To see them fully developed, their huge leaves spreading in all directions and forming a gigantic rosette as large as a house, whilst from the centre rises a mast-like flower-spike, 30 feet high, and crowded with flowers, gives a very different impression from anything which can be effected with pot culture.

Dasylirions are grown very largely both for indoor decoration—the smaller plants being lifted and sent to Paris, &c.—and for effect in the outdoor garden.

Agaves.

Commencing with the Agaves, the following were the most noteworthy of those seen in the various gardens inspected :—

A. americana.—Frequent as large groups in gardens; naturalised in many places.

A Franzosinii, Hort. Hanbury.—A very fine plant, as large as *A. Salmiana*, with glaucous leaves. It is probably new.

A. glaucescens, Hook.—Very healthy at Cannes. When well grown this is a handsome Agave. Its leaves are very soft and succulent, and are easily damaged.

A. Ixtli, Karw. (*A. rigida*, Mill).—Large specimens at Cannes and Mentone, the leaves about 5 feet long ; they are, therefore, the variety called *A. elongata*, Jacobi.

A. Jacobiana, Salmdyck.—A handsome broad-leaved plant, in Mr. Hanbury's collection.

A. potatorum, Zucc.—Some grand plants at Cannes, almost double the size given in Mr. Baker's description.

A. Rumphii, Hassk.—Mr. Baker refers this to *A. vivipara*, but the plant under the former name in Mr. Hanbury's garden looks like a gigantic *A. rigida*. It is a very fine Agave, the leaves about 5 feet long and very numerous.

A. Salmiana, Otto.—In the gardens at Villa Thuret there is a magnificent specimen of this fully 10 feet high and wide. At Mentone it was in flower, the spike 30 feet high and a foot in diameter at the base. A variety called *latifolia*, also at Mentone, had a flower-spike several feet higher and thicker. The pair formed a magnificent spectacle in Mr. Hanbury's garden. I was told by the gardener at Villa Valetta that this species and *A. potatorum* when about to flower develops first short lateral flower-spikes and in the year following a terminal and final spike. A plant of *A. Salmiana*, var. *variegata*, bore several of these lateral, almost basal, spikes at the time of my visit.

A. Scolymus, Karw.—Flowering at Mentone, the spike 25 feet high.

A. spectabilis, Tod.—Two plants met with under the name of *A. applanata* probably belong to this species. There were large specimens with leaves 5 feet long, very glaucous, with a large dark brown terminal spine. The species flowered for the first time at Palermo in 1879 and was named by Sigr. Todaro. The leaves of *A. applanata* seldom exceed a foot in length.

A. vivipara, Linn. (A. Cantula).—A distinct species more resembling a Furcræa. It has lately flowered at Mentone.

Beschorneria.

Several species of this genus of *Amaryllideæ* are of frequent occurrence on the Riviera gardens. They are dwarf stemless plants with a tuberous rootstock and tufted habit. On the lawn at Monte Carlo, and in the garden of the Acclimatisation Society at Hyères, some of the specimens measured 8 feet through. When in flower, these must make a beautiful display. The general effect is not unlike that of large clumps of *Yucca recurva* or *filamentosa* here.

Mr. Gumbleton states that at least one species of *Beschorneria* is hardy at Scarborough and at Cork.

The kinds seen on the Riviera were :—

B. argyrophylla, Hort. Possibly *B. Decosteriana*, of Baker.

B. glauca, Hort. Very similar to the last named.

B. superba, Hort., Hanbury. Also cultivated at Kew, but not yet flowered.

B. yuccoides, Hook. A plant was so named at the Villa Thuret, but the leaves were distinctly filamentose, a character which is absent in the Kew plants.

Furcræa.

The following were noted in one or other of the various gardens visited. At Mentone, Mr. Hanbury has a good collection of Furcræas, mostly very large healthy specimens.

F. Bedinghausii, K. Koch, (Roezlia regia); large plants, with heads 8 feet through on stems 4 feet high. It flowered recently at Villa Valetta. This plant is also cultivated as *F. longæva*, which is, however, a very different plant. It is also represented in Mr. Hanbury's collection under the erratic name of *Yucca Parmentieri*.

F. cubensis, Haw., and its variety *inermis*.

F. flavo-viridis, Hook.

F. gigantea, Vent. The species which yields Mauritius hemp.

F. Lindeni, Jacobi. A magnificent plant with leaves 8 feet long, coloured rich yellow and green. On a lawn at Monte Carlo.

F. longæva, Karw. Several fine specimens in gardens at Cannes.

Beaucarnea and Dasylirion.

Two species only of *Beaucarnea* were noted, viz., *B. longifolia*, Baker, of which some very fine specimens were seen, the most striking perhaps being at Villa Valetta. Its stem is 8 feet high, 2 feet in diameter at the base, and it bore no less than 12 distinct heads of foliage, no doubt the result of its having flowered. What I took to be the same species was a plant in flower at Hyères. It had no visible stem, but a large rosette of recurved strap-shaped leaves about 4 feet long, in the centre of which stood a massive pyramid of flowers fully 6 feet high and 2 feet through at the base; it was a female. *B. recurvata*, Lem., was noted in several gardens and was in flower at Mentone. It is an elegant plant, much less coarse than *B. longifolia*. It is known generally in the Riviera as *Pincenectitia tuberculata*.

Dasylirion is a popular garden genus. Thousands of plants, young and old, were noted in the various nurseries visited, whilst in private gardens some very fine specimens were seen. *D. acrotrichum*, Zucc., is the commonest. At Hyères it was labelled *Bonapartea gracilis*.

D. glaucophyllum, Hook., was in flower at Hyères ; the plants exactly like that now bearing a spike in the Kew collection. It is known in the Riviera as *D. glaucum* and *Bonapartea glauca*. *D. graminifolium*, Zucc., is an elegant little species with scarcely any stem and very narrow spiny leaves. A distinct looking species, unnamed, with narrow, rigid, entire leaves and flower-spikes 5 feet high, was represented by numerous plants at Hyères.

D. quadrangulatum, S. Wats.—This is the plant often known as *Xanthorrhœa hastilis*. It is also, I believe, the *Agave striata*, var. *recurva*, of Baker. In the garden of the Acclimatisation Society at Hyères there is a fine example which was in flower at the time of my visit; it was named *Xanthorrhœa hastilis*. The foliage and habit were exactly the same as those of the plant in the Kew collection called *Agave striata*, var. *recurva;* a provisional name, the plant never having flowered. The specimen at Hyères bore a spike 18 feet high, the upper half clothed with adpressed branches of brown, trigonous, seed-like flowers, not unlike those of a female *D. glaucophyllum*. There is a plant of this so-called *Xanthorrhœa hastilis* at Kew, which came from the Jardin d'Acclimatation, Paris. *Xanthorrhœa* proper is Australian, and has an inflorescence somewhat like a bull-rush. In the garden at Monte Carlo there is a fine example 7 feet through of *D. quadrangulatum;* it is labelled *D. juncæfolium*. Mr. Hanbury has a good plant of true *Xanthorrhœa australis*.

Yucca.

A magnificent group of large plants of *Y. aloifolia* in the garden at Villa Valetta is one of the most striking and novel of the many effects obtained in this garden. The height of the plants averages 15 feet, and many of them are branched. The bases of the dead leaves have been left on the stems, and they have curled and become a rich light brown colour. The gaunt stems, their heads of dark green spear-leaves, and the strange effect produced by the old leaf bases presented a picture peculiarly picturesque. A large group of tall plants of the variegated form at Hyères was almost as effective. All the Yuccas appear to be exceptionally happy under the conditions supplied on the Riviera.

The most striking kinds are as follows:—

Y. aloifolia, Linn. and its variegated form.

Y. constricta, Buckley.—A plant in Mr. Hanbury's collection under the name of *Y. elata marginata* is probably this species. It is near *Y. angustifolia* in habit, but the leaves are shorter. It is a pretty little plant. The garden name may be accounted for by the fact that Engelmann named this species *Y. angustifolia*, var. *elata*.

Y. Desmetiana, Baker.—A plant 9 feet high at Villa Valetta. It is one of the prettiest of the small leaved Yuccas, and is a useful decorative plant.

Y. filifera, Makoy.—A magnificent specimen at Villa Valetta, with a stem 3 feet in diameter at the base; another at Antibes is almost as large. This species is said to attain a height of 50 feet, and its trunk a diameter of 5 feet. The plant at Antibes flowers every year. There is a good figure of this magnificent Yucca in the *Gardener's Chronicle*, June 1888, p. 743, figs. 97, 100.

Y. guatemalensis, Baker.—A variable species, and apparently some of its forms have received garden names. I consider the following to

belong to this species, viz., *Y. Draconis* (Hort. Hanbury, not of Linn.), *Y. Ghiesbreghtii* (Hort. Hanbury), *Y. Eleana* (Hort. Dognin).

Y. Mazelii (Hort. Dognin).—The last named is 25 feet high, and the stem 2 feet through at the base.

Y. Whipplei, Torrey.—A beautiful plant in Mr. Hanbury's garden, fully 3 feet through, with hundreds of straight narrow leaves. It has the aspect of an *Agave* rather than of a *Yucca*. So far as I know this plant has not been a success in English gardens.

Miscellaneous Plants.

In the foregoing notes only those plants are mentioned which from their rarity and supposed delicate nature might not have been expected to thrive satisfactorily even in so favoured a clime as the Riviera. In addition there are also a great many plants which cannot be grouped, and which may go into a bare list of names. It does not appear to be necessary to go further than this, nor does the space at my disposal permit it. The main object is to call attention to the vast number of interesting plants which are in cultivation on the Riviera, so as to afford some idea of what conditions such plants may be expected to thrive in elsewhere.

For a list of plants of all kinds which are cultivated in Mentone the catalogue of plants grown in the open air in the garden of Mr. Hanbury at La Mortola should be consulted. This catalogue is a most interesting one. It bears testimony to the enormous trouble and perseverance that have been brought to bear on the highly useful work of experimental and scientific horticulture. Of course the catalogue contains the names of all the plants in existence at La Mortola at the time of its compilation. It does not attempt to show how many of the plants have become established and are adapted to the neighbourhood, and how many merely exist or have to be frequently renewed. In the latter portion of this catalogue the plants are arranged in geographical order, thus showing how much of the flora of the various divisions of the world is represented in the garden at Mentone.

List of some of the most interesting Plants cultivated and established on the Riviera.

Acacia, many species, some represented by large trees. *A. Farnesiana* is largely grown for its flowers, used in scent making.

Aloe; many species; the most noteworthy as being exceptionally large and healthy, are: *A. ciliaris*, very popular on account of its being always in flower; *A. Dyckii*, *A. frutescens*, *A. nobilis*, *A. plicatilis*, and *A. africana*. At Villa Valetta there is a colony of Aloes, planted so as to produce the most natural wild effect.

Aloysia citriodora, cultivated and used in scent making.

Aralia; A. papyrifera grows to a large size, and is very ornamental. *A. dactylifolia*, *A. Humboldtiana*, and others, as garden plants.

Azalea indica, not represented by large specimens.

Banksia; several species, large and very healthy.

Benthamia fragifera. A beautiful fruit tree.

Bougainvillea glabra and *B. spectabilis*. "The glory of the Riviera."

Cacti. Very many kinds.

Camellia. Require very careful cultivation and shade.

Carica candamarcensis. A large plant in fruit at Mentone.

Casimiroa edulis ; the Mexican Apple. A tree, perfectly healthy, at Mentone.

Catha edulis, Arabian Tea.

Ceratonia siliqua.—Very common, in fruit.

Chrysophyllum imperiale (Theophrasta) ; a large healthy specimen at Villa Valetta. This plant is invariably unhappy under cultivation ; probably it dislikes a stove temperature all the year round.

Citrus trifoliata ; used as a hedge plant, makes a strong fence.

Cyphomandra betacea, the Tree Tomata ; an old plant covered with fruit in Mr. Hanbury's garden, and another at Monte Carlo, where it was labelled *Solanum Wallisii.*

Dammara robusta and *D. Brownii*, large trees 30 feet high.

Diospyros.—In the garden of the Acclimatisation Society at Hyères there is a series of trees of *Diospryos*, bearing the following names :— *D. costata*, *D. Lotus*, *D. Roxburghii*, *D. Mazelii*, and *D. Kaki.* These all appear to be forms of one species. I found the fruits offered for sale in Paris. The trees were in fruit at Hyères at the time of my visit, and were exceedingly handsome. They were about the same size as an ordinary apple tree, say, 10 feet high, and they bore hundreds of fruits somewhat resembling a large compressed tomato in size, form, and colour. The flavour of the fruit is rich, very sweet, but rather woody. If taken properly in hand a valuable fruit might be developed from them. The flavour wants slightly improving and that is all.

Doryanthes Palmeri, Hill.—Fine plants at Cannes, one of them showing flower.

Dracæna indivisa, *D. Draco*, and *D. australis* are of course plentiful all along the Riviera, the last named being as abundant as *Phœnix.*

Eriobotrya japonica.—One of the delights of the Riviera, very fragrant in early winter when it flowers. Cultivated for its fruits.

Eucalyptus ; many species.

Ficus elastica, *F. macrophylla*, and *F. rubiginosa*, all large handsome trees.

Freycenetia Banksii ; quite hardy at Cannes, where it has flowered.

Grevillea robusta ; frequent as a large tree.

Greyia Sutherlandi.—A large plant in fine health at Cannes ; it blossoms freely and regularly in March.

Hakea ; some large healthy plants at Mentone ; *H. eucalyptoides* in flower, was one of the most beautiful objects I have ever seen.

Jacaranda mimosæfolia ; large healthy specimens in several gardens.

Jasminum grandiflorum.—One of the prettiest and most fragrant of Jasmines ; largely cultivated and used in the manufacture of scent.

Magnolia grandiflora ; very large trees, plentiful in gardens ; the form with ferrugineous down on the under side of the leaves is called *M. ferruginea.* The fruit in autumn is almost as ornamental as the flowers.

Monstera deliciosa, not quite hardy on a lawn at Cannes, where it grows against a palm and fruits annually.

Musa sapientum and *M. Ensete*, all in good health, the last named flowering in Mr. Hanbury's garden.

Myoporum ; several species planted in positions very near the sea.

Papyrus antiquorum, in positions sheltered from wind.

Persea gratissima ; a large tree in Mr. Hanbury's garden.

Pilocarpus pennatifolius, the "Jaborandi," a large bush bearing flowers and fruit at Mentone.

Pittosporum, about a dozen species apparently naturalised in the Riviera.

Psidium Cattleyanum and *P. Guayava;* in fruit at the time of my visit.

Puya gigas, Andre.—A fine plant, perfectly happy in Mr. Hanbury's garden. This species produces a flower spike 30 feet high, and white flowers tinged with red and violet. It is in the Kew collection.

Rhododendron; very poorly represented.

Russellia juncea; a common garden plant, beautifully in flower in October.

Strelitzia augusta and *S. Reginæ*, both as fine as at the Cape or Madeira.

Trevesia sundaica and *T. sp.*—These two plants astonished me. They are both natives of Singapore, but at Cannes and Nice they were in perfect health, and had been so for years.

W. Watson.